Protocol for Standard Analysis for Cesium-137

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1.0 Sample Preparation and Characteristics

The following comments apply principally to the fine-grained, highly inorganic sediments (organic matter <5%) recovered from box or gravity cores from the Great Lakes. Preferably samples should be freeze-dried and disaggregated lightly using mortar and pestle so as to pass through a 0.50 mm sieve. In rare instances where there are pieces resistant to disaggregation, such as shells, fibrous organic matter, cinders or stones, they should be removed and their removal noted in comment spaces of final records.

2.0 Sample Geometry

For sample weights above 6 grams, use the standard (150 ml) snap cap counting vials ("standard geometry") which have been cleaned, rinsed with distilled water and dried. When possible load vials with 20.0 $\pm$ 0.2 g of dry sediment. When less sediment is available, use the entire portion for counting. When less than 6 g of sediment is available, use plastic scintillation vials ("small sample geometry"). In either case, record net weights to at least three digits to the right of the decimal point. Level out the surface of the sediments in the vials by tapping them on a counter or by other effective techniques. The height of the surface above the outside bottom of the vial should vary by no more than 1 mm. Either before or after counting, estimate the height of the surface above the outside bottom of the container (to $\pm$ 0.05 cm).

3.0 Sample Counting

Check the condition of the polyethylene protective sheet over the top of the detector housing. Replace if dirty. Place the appropriate retainer collar for standard or small sample geometry over the detector housing. Gently place vial in the center of the retainer collar making sure that it rests on the top of the detector housing. Do not force the sample on to the housing top since it is made of thin aluminum and can easily be damaged. If the sample is not seating properly, remove it and determine the cause of the problem. Gently close the clam-shell top of the shield. Zero (ALT-3) the appropriate multichannel analyzer (MCA) and initialize counting (ALT-1). Each sample should generally be counted from 12 to 24 hours.

4.0 MCA Data Processing and File Storage

On completion of counting, stop the MCA (ALT-2) and transfer the spectrum from the Multichannel Buffer (MCB) to the computer (ALT-5). Switch to the computer-based spectrum for further data processing (ALT-6). Select the appropriate region of interest (ROI) file (usually DET*.ROI) using ALT-R and ALT-S. This will illuminate about 11 regions of which two should be manually reset after each counting to take care of the possibility of small system gain shifts. The two regions are for Cs-137 (661.6 KeV) and K-40 (1460.8 KeV). Locate these regions by

first holding down the shift key while depressing the left or right arrow key to locate the left or right edge of the appropriate ROI. Then hole down the CRTL key while using the left or right arrow keys to locate the photopeak maximum. Use the DEL key to remove the existing ROI for the peak and the INS key to redefine it for the present spectrum. Having established correct ROIs, insert the current 1.4 mb floppy disk into the appropriate hard drive, and instruct the system to save the MCA file (ALT-F then ALT-S). In response to the resultant query, enter the current file name for the spectrum. This will always have the form A:D*_xxxx.CHN where * is the detector index 1-4 and xxxx is the record number (for example D1_0626.CHN). This number can be inferred from inspection of the printed reports in the counting lab. Enter this information. Following entry (using RETURN) enter requested information on the sample analyzed. This generally has the form: lake abbreviation and year, sample code, section interval, net sample weight and height of sample above bottom of the vial (for example LM94 41A 10-12 CM 20.0265 G H=1.5 cm). In addition to filing the entire spectral record, produce a hard copy report by using ALT-F then ALT-T and entering PRN in response to the query. The top of the printed output should be labeled with the file name of the report (D1_0626.RPT). The report may be stored on the floppy using ALT-F the ALT-T and entering A:D*_xxxx.RPT to the query.

5.0 Detector Stability Check

Count the radiocesium standard sediment (standard geometry AMS-86-1 20G) on detectors #1 and #2 on alternate weeks for at least three hours. This standard has three detectable gammas, the one from Cs-137 (661.6 KeV) and two from Co-60 (1173.2 and 1332.5 KeV). The appropriate ROIs can be loaded from files AMS1.ROI or AMS2.ROI. Files should be saved on the appropriate floppy for the detector numbered in sequence with the samples. A report should be printed as well and the counting time plus net counts and error for each of the three photopeaks entered in GAM1.DAT or GAM2.DAT files for use with stability monitoring programs.